

The legendary all-metal Ford Trimotor  
first rolled out of Ford's Dearborn, Michigan factory in 1926.  
Forty-eight years later, the 'Tin Goose' is still flying.  
You can combine history and nostalgia  
with this easy-to-fly Ford 5AT  
constructed of foam and corrugated cardboard.



# TIN GOOSE

● Almost forty-eight years ago, in July of 1926, the first all metal Ford Trimotor airplane rolled out of the Ford shops at Dearborn, Michigan. Incredible as it may seem, there are still several of these big three engine all-metal airplanes still flying. No other airplane contributed more to the early development of our airline system than the Ford Trimotor. It was the first to fly on a regular scheduled airline operation, and the first to carry two uniformed pilots and a flight steward. The Ford could fly equally well on any two of its three engines, and could maintain level flight on only one engine. The Tin Goose could land in any small field and could take off in three times the length of a football field fully loaded! One of the most famous Trimotors of all was the Floyd Bennett. Admiral Byrd flew this airplane over the South Pole on Thanksgiving Day, 1929.

Two models of Ford Trimotors were built, the 4AT and 5AT. The former had a wing span of 74 feet and was powered with Wright J5 or J6 engines of approximately 225 horsepower each. The larger 5AT, which was our choice for a model, was nearly 78' in wing span and was powered with three Pratt and Whitney Wasp engines

## BY HARRY W. BROWN

of over 400 HP each.

Some will wonder where the name "Tin Goose" came from. Those of you who have flown full size aircraft, particularly tail draggers with non-steerable tail wheels, can imagine what it must have been like to open up three big engines on the take-off roll, using the brakes to keep it straight. The resulting sight resembled a fat goose on his take-off run, hence the name.

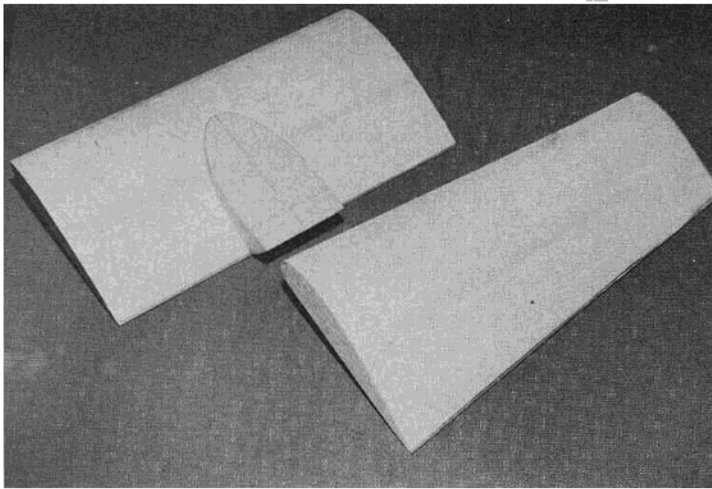
Probably one of the most exciting things done in a Ford Trimotor was the exhibition put on by Harold Johnson during the Cleveland air races of 1939. Johnson took a Ford Trimotor into the air and put it through all of the aerobatics that would be normally done by a powerful little biplane. Johnson did snap rolls, Immelmans, inverted flight right down the runway, and climaxed the show with a series of king size loops. Shades of Bob Hoover!

Most of us who construct and fly small radio controlled aircraft have, at one time or another, fallen in love with a particular design. In my case, it ran from early WW I biplanes like the Se5 and Fokker D7 to WW II fighters such as the P40 and P63. I

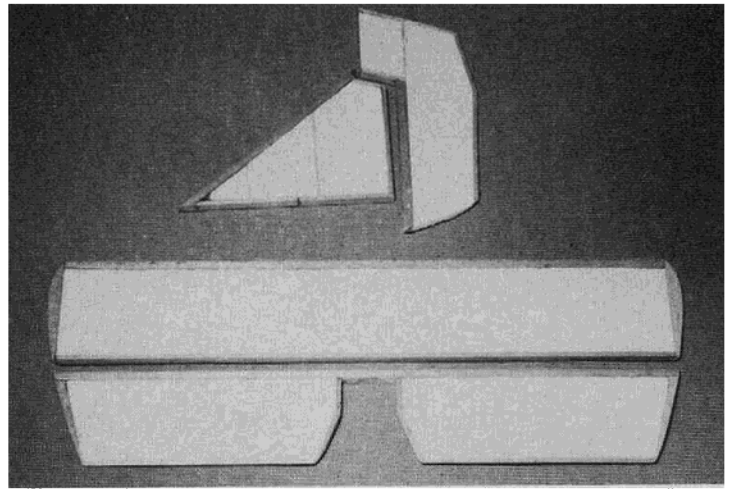
have always been partial to scale or semi-scale, and, although I enjoy aerobatics very much, I have no interest in competitive pattern type flying.

I must say that I even surprised myself when suddenly I just had to build a Ford Trimotor. Immediately the thought flashed through my mind of a beautiful big silver bird powered with 3 Wankels climbing into the blue while the crowds applauded and cheered.

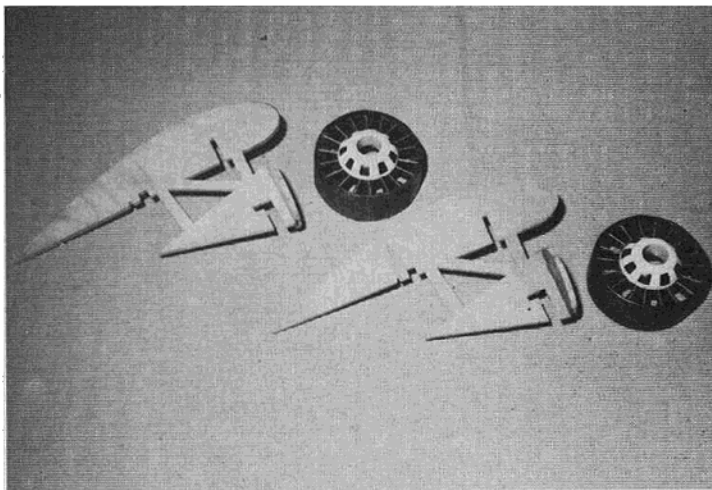
There was one small problem however, and that was how to obtain a corrugated effect. Gluing on thousands of balsa strips over sheet balsa sort of stopped me cold and I also shuddered at the cost! This is hardly the task for one who has trouble putting together a kit with all die cut parts. One of the reasons I like to scratch build is that I find it easier to do it this way. Inasmuch as my profession is a business that is affiliated with the paper industry, I was well aware of the lightness, strength and easy-to-work qualities of corrugated cardboard. During the past few years I have built several RC airplanes constructed of corrugated cardboard, and also had experimented with corrugated cardboard and foam combinations.



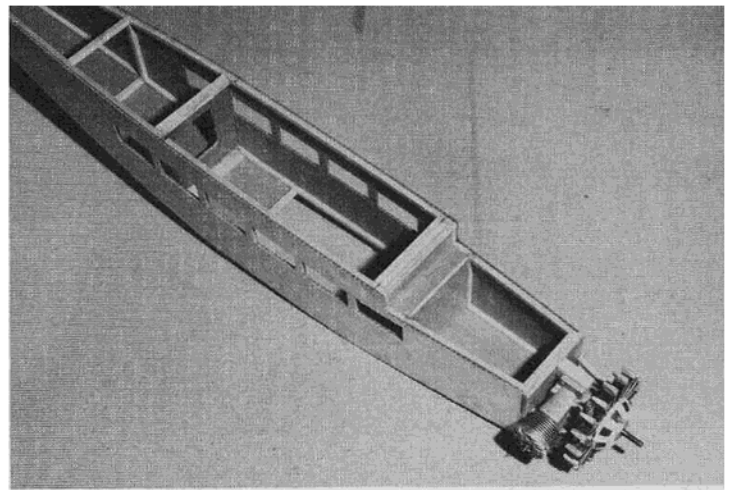
**FOAM CORES FOR ONE WING PANEL WITH LEADING AND TRAILING EDGES Balsa FACED.**



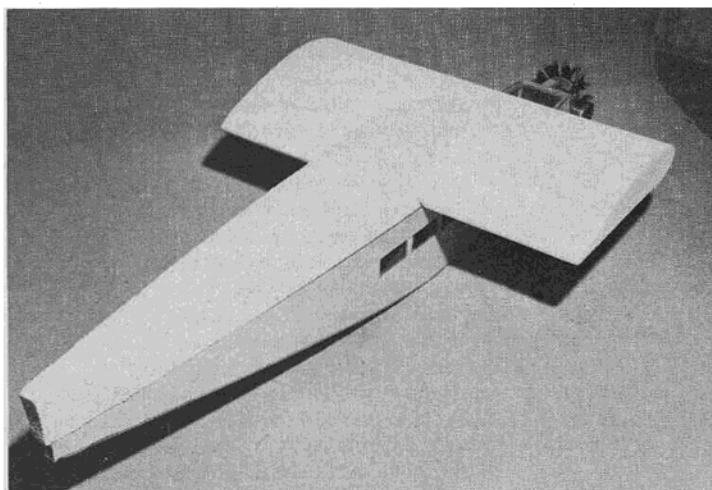
**FOAM TAIL SURFACES, EDGED WITH Balsa FOR STRENGTH AND DURABILITY.**



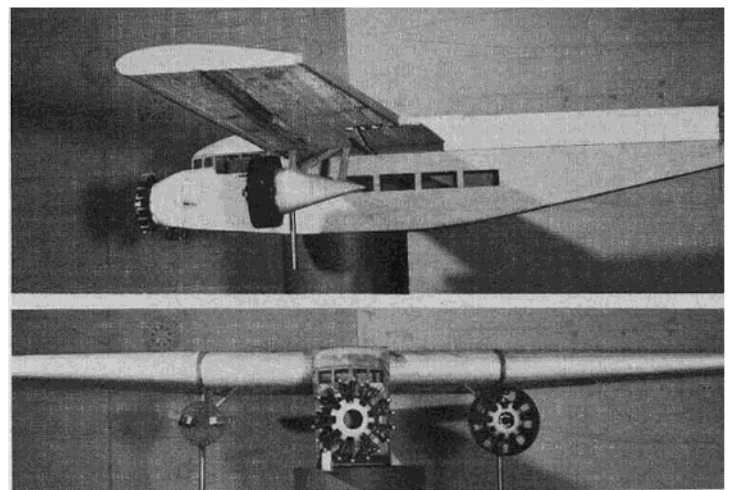
**PLYWOOD NACELLE CORES AND WING ENGINE RING COWLS.**



**BASIC FUSELAGE STRUCTURE OF CORRUGATED CARDBOARD AND WOOD BRACING.**



**FOAM TURTLEDECK ADDED TO BASIC FUSELAGE STRUCTURE.**



**TWO VIEWS OF BASIC CONSTRUCTION PRIOR TO APPLYING CORRUGATED CARDBOARD.**

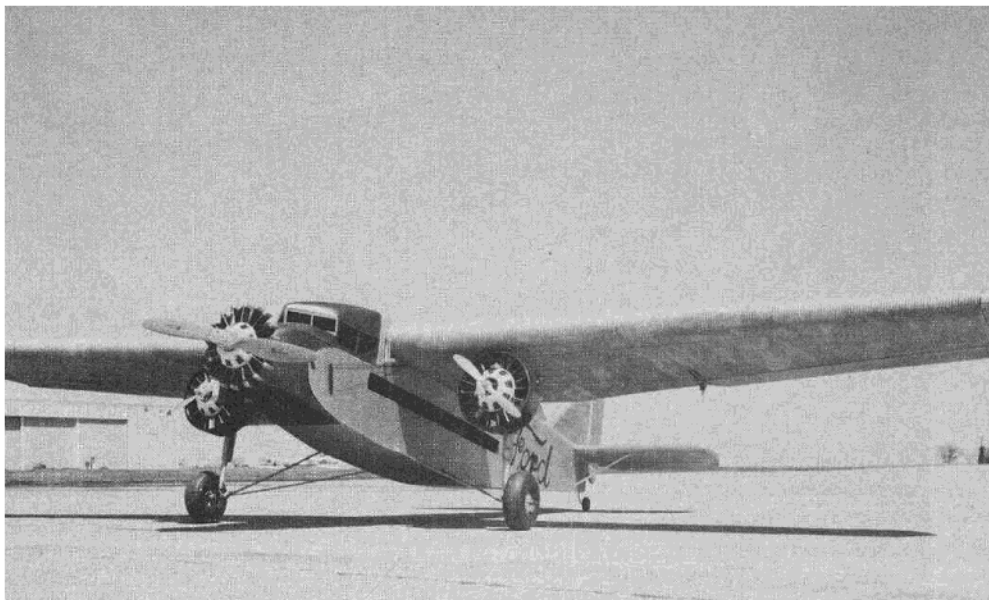
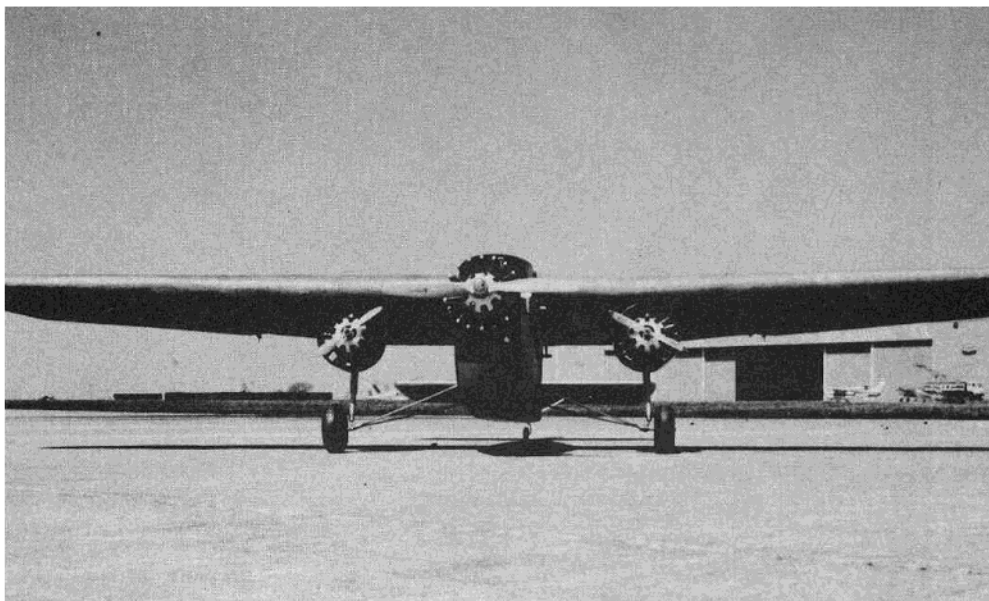
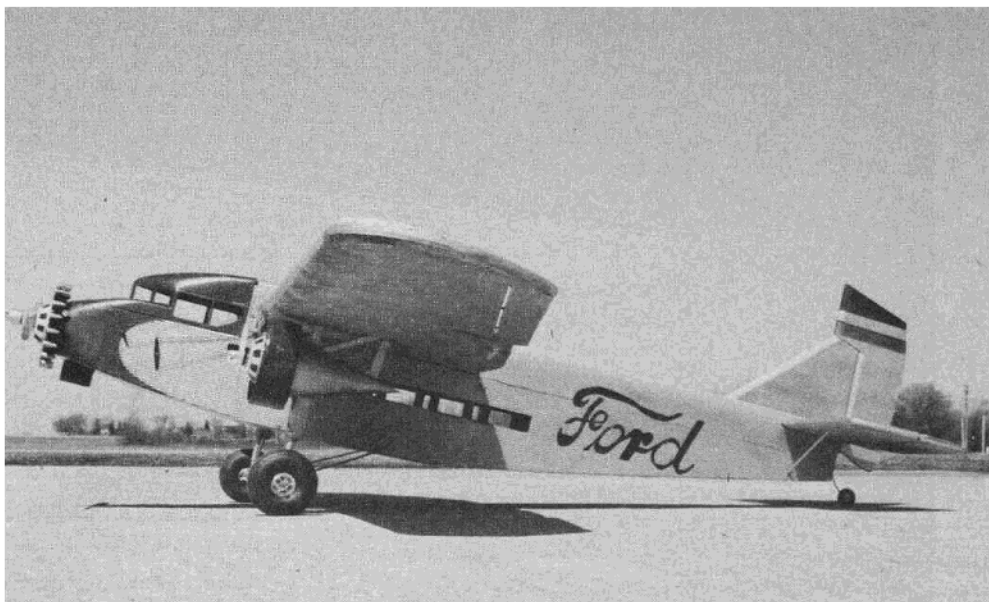
The Ford Trimotors fuselage was constructed of regular "B" flute corrugated board that is used for shipping containers, and the entire airplane was covered with single face "E" flute corrugation. The "B" flute double face is approximately 5/32" thick and weighs about as much as 3/16" hard balsa. It is, however, stronger than balsa and more flexible. The "E" flute single face covering material is about 1/16" thick and is quite light.

As you can see by the plans, the Ford is constructed entirely of the "B" flute type board covered with a single face "E" flute, foam, plywood, and balsa. 3/16" square spruce or basswood could be used for the stringers instead of the 1/4" balsa. The plywood I used was scrap wall paneling such as you might use to finish a playroom. This material is very light and strong and usually can be obtained in thicknesses of about 1/8" to 1/4". I use this type of plywood in model construction even for firewalls. It is not quite as strong as the heavier aircraft type plywood, but is much lighter, and, I have never had a structural failure because of it.

The first thing to be done before starting construction of this airplane is to go to your local lumber yard or building supply dealer and obtain one piece of insulating foam 2' x 8' x 2" thick. We will also need another piece 1" thick. This will cost about \$3.00 and will be enough foam for 2 planes. While at the lumber yard pick up two yard sticks (usually free) and some various sizes of the wall paneling. Usually they will give you these — I found mine in a scrap bin. Also pick up a 3/8" dowel for the secondary wing spar.

Titebond and 5-minute epoxy were used throughout the construction of the Trimotor, as my time is rather limited and I find that spotting with 5-minute epoxy followed up with Titebond makes for fast building. You will also need the "B" flute corrugating cardboard which you can obtain from your local appliance dealer. Try to pick a box that has good straight sides if possible and you will have enough cardboard to build several airplanes. If you can't find the single face covering material it may be obtained at a nominal cost by writing to me, Harry W. Brown, 921 E. Washington Street, Appleton, Wisconsin 54911. The total cost for the materials to build this big three engine bird was less than \$20.00. If this 78" span Trimotor was constructed in the conventional manner, it would have cost a small fortune with today's prices. Not only that, it would take longer to build.

The Tin Goose was built on a 1" - 1' scale "more or less" and weighs about 11 pounds ready to "wobble" down the runway. After the visions of three Wankels, three .40's and three .29's, I finally settled on my three year old Enya .60 (12/6 prop) in the nose and two Cox Golden Bees (6/4 props) in each wing nacelle. From time to time I have seen beautiful twin engine birds such as P38's and B25's become instant kits because of failure of one engine. The type of



engine configuration used in the Ford has a good safety factor for three engine craft, as the big nose engine creates good rudder control. This is not to say that the Ford could not fly, or be quite safe to fly with two RC .10 or .15 size engines in the wings, controlled separately from the nose engine.

Very little attention was given to scale details in this airplane, as it was an experiment to determine whether or not a big semi-scale, multi engine airplane could be built at very little expense while turning out to be one that would also be fun to fly. With this basic plan and some research, a good sport scale Trimotor could very easily be a contest model.

### CONSTRUCTION

Begin construction with the fuselage. From your 1/8" corrugation cut two basic sides, not forgetting to cut out the windows in the proper location before joining the sides together. No doublers were used in my original model, although I am sure that 1/32" plywood from the firewall to the aft of the cabin would make the structure a little stronger. I painted the inside of the fuselage in this area with two coats of polyester resin which created a strong structure. Install 1/8" plywood paneling between the longerons from the nose all the way back to just aft of the landing gear. This makes for a very strong structure, as the bottom is covered with ply and balsa. You will find that it will be necessary to line the inside of the cabin windows to cover up the corrugated board. I used a black tape approximately 1/8" wide for this purpose. This should be done before the resin is applied which will help seal it.

At this time your favorite .60 engine should be mounted. Use your choice of mounts here. My method is to locate the thrust line and mount the engine on maple blocks as close to the firewall as possible. You will note the thrust line is at the bottom of the cabin windows. I always insert a 1/4" piece of plywood inside the nose and then epoxy the 1/4" plywood firewall to it. This produces a 1/2" thick firewall in which to insert the maple motor mount. This method is inexpensive and allows you to mount the .60 engine right against the firewall. If other mounts are used, be sure to allow for this in locating the dummy engine and nose ring. If you use another type mount, it will do no harm to increase the nose length 1/4" or so as you are going to need the weight in the nose anyway. Don't be afraid to pack in block bracing under the motor mounts if wood is used. Use triangular stock if you wish inside the nose compartment.

At this point it is a good idea to locate the tank and make your cutouts for the throttle rod, fuel lines, etc. Saw the frames for the pilot's cabin windows from 1/8" aircraft plywood. The balsa blocks used for the nose cannot be shaped until the wing is mounted in its proper position and the dummy nose engine built and mounted on the nose ring. This will insure a proper contour from the nose to the top of the wing.

I used regular building insulating style foam, purchased at the local lumber yard for wing core material. It will be necessary to glue the 1" panel to the 2" panel to provide a 3" thickness for the wing. Use Titebond for this and weight down on a flat surface. Using two of the root rib template, cut the wing center section, hot-wiring the two end panels separately. Be sure to cut one right and one left panel, using the root rib and the tip rib template. When cutting these tip sections, be sure to cut the dihedral in the bottom. The top of the wing on the Ford is flat, and all the dihedral extends from the center section out to the tip. I used 1° of washout in each tip. This was accomplished by raising the trailing edge of the tip template about 1/16" from that of the root template.

The styrofoam I used weighed about 1 1/4 lbs. per cubic foot. This weight may vary from anything to 1 lb. to 1 1/2 lbs. per cu. foot. If you have never cut foam wings before, try to get someone to assist you, as this is a very important part of the airplane construction. Make the aileron cutouts in the foam, which are approximately 18" long by 1 1/2". Taper 1/4" balsa to fit on the wing section and on the leading edge section of the aileron. This brings the aileron about 1/2" out from the trailing edge of the wing, which is tapered in on the inside end to create the unusual looking control surfaces. As shown on the plans, line the inside of the aileron and wing with 1/16" sheet balsa.

The wing panels are joined to the plywood rib with an engine nacelle on each side. Remember the top of the wing should be flat, so use extreme care setting this up during the joining process. You can either do this by placing the wing upside down on a flat surface, or block up the tips and use a straight edge across the top of the wing. I used five minute epoxy and Titebond for this process.

The wing tips can be fashioned of foam or of hollowed-out balsa. If foam is used it should be given two coats of Hobbypoxy II, or slightly diluted epoxy for strength.

The wing should now be properly aligned on top of the fuselage and the balsa block glued to the leading edge. The whole nose section may be shaped up to the engine ring with block balsa. The nose section in front of the windows should be gradually rounded to fit the nose ring. It will be necessary to mount your engine during this process in order to boock around the engine and yet still allow for its removal. This will have to be 'eyeballed' as engines will vary.

The main gear should now be bent and shaped from the side and front views shown on the plan. I use the coat hanger method, as I find that this is the easiest way to get a true shape without experimenting with the heavy steel wire. The shape of the landing gear is quite critical on the Ford as the gear fits into the tubing projecting down from the engine nacelles as illustrated. During the fitting of the main gear the wing should be mounted in its proper position and the tubing should be inserted in the slot provided in the

plywood engine nacelle plate. Make sure that proper alignment occurs here when the 3/8" tubing is placed in the plywood slot of the nacelle. Be sure to insert the spring first and epoxy this in place up against the plywood plate. The spring should be a compression type, or if none is available, use a small spring and stretch it to provide compression. The location of the vertical piece of wire with the wheel collars and tubing that is inserted into the main gear tube is critical, and the gear and wing should be done at the same time to provide accurate alignment. With this type landing gear, the shock is absorbed by the wheel and gear and then transmitted to the wing. This is why the wing is mounted with rubber bands instead of nylon bolts. I think that it would be possible to mount the wing securely with the bolt arrangement if the pilot is accustomed to flying heavy scale models.

The tail assembly is very simply constructed of foam slabs. Cut these slabs with your hot wire using a couple of yard sticks as guides on the block. They may curl a little after cutting from the heat, so move rather quickly during this cutting procedure. Weight down after installing the balsa perimeter until dry. The leading edge material allows for the 1/16" corrugated skin to fit nicely over the foam into the leading edge. The stabilizer is mounted on the balsa block shown.

After the tail assembly is completed, the foam block for the top of the fuselage should be cut to fit and also the foam block that fits against this on the top of the wing. The foam blocks may be shaped roughly by using a saw. I made one out of an old hack saw blade which works very well. The finishing shaping with sandpaper (be careful) can then be done. Also, shape the block that fits on top of the wing. Face the slanted adjoining area with 1/16" balsa. Be sure to run the NyRods from the stabilizer and rudder into the fuselage before gluing down the top foam block of the fuselage.

The engine nacelles should be finished in rounded cone shape using balsa blocks hollowed out as much as possible to keep the weight to a minimum. Be sure to have balsa blocks around the landing gear tubing which projects up into the nacelle plywood. On the R5AT Trimotors, the nose engine was not cowled but both wing engines usually had cowling rings. We improvised here a little and constructed simple dummy engines of plywood and small balsa rings which were turned in a hand drill. Use small wire brads to simulate valve rods. Much more detail could be given to these engines, of course but, as we have said before, no attempt was made to build a detailed scale model. This Ford could really be beautiful if scale Williams Bros. cylinders of the Pratt and Whitney engines were used.

Form the cowl rings out of 1/32" plywood or thin wood veneer. If that is not available use a heavy, stiff hardboard as an alternate. For a building form to construct these engines, cut a circle of the correct diameter out of 2" foam on your jigsaw,

and use this to form the ring. Cover the foam block with wax paper and then wrap the thin plywood or veneer around this, sealing with 5 minute epoxy and tape. Cover with 1/8" balsa with the grain running fore and aft, using narrow strips in order to prevent too much of a bend. Contact cement is good for this operation. Sand to shape and then give the whole thing a good coat of Hobbyoxy II. K & B resin could be used here as long as the wax paper protects the foam. Cutouts for the engines will have to be done by the 'eyeball' method. I found that the cutouts for the wing nacelle engines were quite simple and the Golden Bee hardly shows at all. I was able to retain most of the cylinders, just cutting out enough for air cooling. The exposed nose engine fits quite well around my Enya .60, and I was able to retain all the cylinders, although one is much thinner than the others. You will note that the wing engines are 1/4" plywood whereas the nose engine is constructed of two 1/4" pieces (one ply and one balsa).

The bottom of the fuselage from the firewall back to the front gear wire is covered with balsa and shaped. I also inserted 1/8" wall paneling between the longerons in the nose section for added strength. The entire inside and outside of the fuselage from the firewall, to the rear cabin window is given two coats of polyester resin for added strength. The windows should be installed on the inside of the frames both in the pilots cabin, and main cabin. The frames should be painted first before this is done for obvious reasons.

The tail surfaces and the fuselage are covered with the 1/16" "E" flute single faced corrugated skin. I used Sig contact cement for this process as there is danger of other cements attacking foam. The bottom of the fuselage was finished with K & B resin.

Covering the wing is probably the most difficult part of constructing this bird. Before covering the wing, make sure that it is in perfect alignment and that there are no unusual protruding surfaces. A slight sanding may be necessary, but be sure all dust is removed. The aileron assembly must be installed first and a suitable cutout made for the aileron servo. I used a Weller soldering gun for all cutouts. The ailerons are covered separately and attached after the wing is covered. Be sure fiberglass tape strips are run along the bottom and the top of the wing before covering. I find that this tape will correct some minor bowing of the panels as well as adding strength.

The most difficult part of the covering process is to bring the corrugating skin around the leading edge of the wing without cracking it. My method was to cut a piece of the skin long enough to reach from the front of the nacelle struts around the leading edge and down back to the trailing edge on the top side of the wing. With the wing upside down contact cement this covering up to the point where the curve starts to come up around the leading edge. It will probably be

better to use two pieces equal to one half the wing span during this procedure. Now wet both the underneath and the top part of the leading edge corrugated covering with water. I used a small paint brush for this. You will find that the material will start to bend around the leading edge from its own weight. Carefully guide it until you have about one half the curve desired or, in other words, with the covering hanging about 90° down. Let this dry thoroughly, and then contact cement this area to the foam wing. You will probably need a long handled brush, or tie a small brush on the end of a stick to accomplish this operation. When the cement is thoroughly dry, re-wet the skin covering around the leading edge. Carefully bring the skin covering to a 45° angle from the wing pointing toward the trailing edge. Let dry thoroughly then contact cement in place. You should now be able to cement the covering down perfectly the rest of the way.

It might be a good idea to practice the procedure before actually attempting it on the wing. I did this by using a piece of the center section foam airfoil and small pieces of the skin covering. During this practice period it is not necessary to cement the covering down, but just go over the wetting and bending procedure. As I said before, the trick is to let part of it dry before attempting any further bends. Now line up the corrugations and cover the rest of the flat bottom. Do not cover the center section on the bottom.

The corrugation could, of course, be simulated by using 1/16" balsa strips over a balsa skin but this would take a great deal of time and patience I am sure. Do not forget to install the small strips of tin on the leading and trailing edges underneath the corrugated covering to protect the foam from the rubber bands.

The Tin Goose was finished with K & B resin in all areas that does not come in contact with the foam. Do not use any finishing material that would dissolve the foam unless complete sealing is obtained. It would be far better to use Hobbyoxy II or other finishing materials that would not attack foam on the wing and tail sections. I found a very good finishing material at the local lumber yard made by the Behr Company and it is called 50 Coats. It is used in decoupage finishing and provides a hard glossy surface. It is very thick and should be thinned slightly before using. The epoxy, or polyester, resins work very well as a finish on the corrugated skin covering. I only gave it one coat and then lightly steel wooled the covering to obtain smoothness. This made the covering very hard and durable.

The tail, wings and corrugation on the fuselage were painted silver. I used a silver paint obtained at the local paint store that will not attack foam. The trade name is Roma, but it is not fuel proof necessitating the use of clear polyurethane spray over the silver. I painted the engine cowl rings red and the Ford name blue. Other than the

name Ford on the side, no attempt was made to detail or decorate the prototype. It would be quite simple, however, to duplicate the Ford Trimotors at Island Airways in Port Clinton, Ohio, or some of the older American or TWA Fords.

A 12 ounce tank was used for the Enya .60 in the nose. The Golden Bees of course, have their own tank mounted to the firewalls. The cowl rings are held by blind nuts on blocks epoxied to the firewalls. Small auxiliary tanks for the Golden Bees could be mounted in the nacelles for additional running time. I found that the Golden Bees run about 4 minutes using a 6/4 propeller. Cox glow clips can be left attached to the engines with wire leads out the back for starting. A starter will come in handy also. Needle valves should be set with cowls off for good running positions.

Locate the servos, battery, and receiver as far forward as possible for balance. I used a Kraft 4 channel radio. Add lead to the nose if necessary. **Do not** attempt to fly this airplane if it is tail heavy!

After finishing the Trimotor, I found that it weighed just over 11 pounds. The big question was, would the Enya .60 and the two little .049's lift off this 78", 11 pound giant? None of us in the Valley Aeromodelers Club here in Appleton, Wisconsin, had ever flown anything heavier than 7 or 8 pounds. I took the airplane out to our field one sunny Saturday afternoon and fired up all three engines. The sound of them wide open was a little disturbing to one who is used to a single engine. With the Golden Bees turning at about 15,000 and the Enya .60 at about 11,000 it was really something!

I then decided to taxi the airplane around the field, just to see how it would handle on the ground. It was quite good, and when I came back up around the perimeter of the field, I headed into the wind and opened the Enya wide open. The tail came up right away and, after a run of about 70 feet, I flew at an altitude of 1 foot for about 30 feet. I would say that it was a typical Wright Brothers flight. I just wanted to find out if it would fly and an altitude of one foot seemed to be a good way to start.

I had asked my good friend Jim Taylor of our club, who not only is an expert RC pilot, but a photographer of professional status as well, to shoot some pictures of the Ford the next weekend. I wanted to get the pictures taken before we put the bird up for its first real flight.

After we did the pictures, we fired up all three engines. I had no intention of flying the Ford, as the wind was gusty and it was cold. With the 3 engines running and everyone yelling to let it go, I gave the transmitter to Jim. Jim opened up the Enya and the Ford started its take-off roll. To say I was nervous is putting it mildly! After a 70 or 80 foot run, the Tin Goose broke ground in a left turn. As Jim is an expert pilot he leveled off and immediately made a right

turn over the field. What a sight!

Jim climbed the Ford to about 200 feet, the plane flying in a very stable mode. After about 4 minutes the Golden Bees quit, one at a time, with no effect on yaw. The Enya .60 flew the Ford perfectly with the wing engines dead. Jim flew the ship another 3 or 4 minutes and then began a long final approach. The landing was beautiful, coming in on the main wheels with the tail up. As with all heavy ships, Jim used power as needed to maintain flying speed. When the Ford stopped rolling, everyone cheered, including me.

The Tin Goose was fun to build and is a good basic design for an RC model. I can assure you it will draw a crowd when you bring it out to the field. If you have never flown a heavy tail dragger, be sure you have enough speed on take-off before rotating. Use power on final and wheel land it.

I would like to dedicate this article to my good friend Jim Taylor since, without his encouragement, photographs, and flying skill, the Tin Goose might never have left the ground. □

## **From RCModeler Oct. 1974**